PASCAL-TYPE CALCULATOR

Why do we call the calculator the "Pascal-type calculator"?

Around 1640, about the time the pilgrims were having their first Thanksgiving and just before the glorious era of King Louis XIV, there lived in Rouen, France, a man named Etienne Pascal. He was a tax official for the government. He had a son, Blaise, who at age 19, went to work for him in his tax office. Blaise was so brilliant that his father relied upon him to do all the calculating of the various taxes.

Blaise, however, became bored with the job of adding long columns of figures and tried to find a short cut. After many attempts, he constructed a mechanical adding machine, the Machine Arithmetique, that could add and subtract. It was a box, about the size of a portable cassette tape recorder, with six wheels (gears), each with ten teeth and each with ten numerals marked from 0 - 9. After one complete revolution, each wheel showed the 0 again and automatically moved the wheel on its left forward one number. To add, the wheels were turned according to the amount added, and the total, up to six places, appeared in the windows above the wheels. Blaise Pascal's box was the first calculator that could do re-grouping automatically. Burt's Pascal-type, transparent calculator is a modern version (but with four places) of Pascal's 17th century adder. You might say that, except for your fingers and thumbs, you have a modern working model of the world's first computer!

CALCULATOR ACTIVITIES

1. Use the pointer to change the numbers on the calculator any way you would like.
2. The window on the right shows the ones circle. What do you think the others show?
3. Put a zero (0) in every window. Now put a different number in every window. Here is a trick! Look at the red circles. Find the white square in each red circle. Put your pointer in the hole where the white square is and dial all the way around to the left (counterclockwise). Do the same thing with the other dials. Now look at the windows. What happened? Do you see a zero (0) in all the windows? This is called "clearing the machine".
4. Clear your machine (all windows should show 0). Look at the white numbers in the black circles. Use the ones circle. Put your pointer in the hole beside number 8. Dial all the way around to the right (clockwise) as far as you can. How much does the ones window show? On the same dial (ones circle), dial 2 the same way (clockwise). Look at the windows. What happened? The machine, by itself regroups 10 ones to 1 ten. Try to make other regroupings in the windows. Look at the back of the machine and see how the regrouping works.

ADDITION

1. You can add on your calculator. You did it in #4 above: 8 + 2 = 10. Try these on your calculator: 4 + 3 = ☐ 8 + 4 = ☐ 9 + 3 = ☐ 5 + 9 = ☐ Make up your own addition problems.
2. Now let's look at the numerals in the tens circle. Show 15 in the windows. Add 6 to it in the ones circle. What happened? 15 + 6 = 21 Try these: 12 + 5 = ☐ 16 + 44 = ☐ 18 + 23 = ☐ 10 + 85 = ☐ Now make some equations of your own!
3. Now let's work in the hundreds. Show 300 in the windows. Add 3 to it. What did you get? 300 + 3 = 303 Try these: 329 + 4 = ☐ 410 + 41 = ☐ 271 + 13 = ☐ 525 + 525 = ☐ Try some equations of your own.
4. Think of a number with thousands in it. Show it in the windows. Add any number you want. Did you get the right answer?
5. Using all the dials, dial in the highest number you can show in each window. What is the number when you read all 4 dials? Is this the highest number you can show in your calculator? Add 1 to your highest number. Can the calculator show answers of 10,000 or more?
6. Play a game! Have someone give you an addition equation. Try it on the calculator. The other person should figure out his/her own answer without the calculator. See if you agree!

SUBTRACTION

1. Clear your machine. Try 8 - 6 = ☐ Here's how to do it: dial to the right and put 8 in the one's window. Put your pointer on the small black number 6 (inside the same dial). Dial the 6 to the left, all the way around (counterclockwise). What answer did you get? Try these: 8 - 2 = ☐ 6 - 3 = ☐ 5 - 4 = ☐ Try some of your own subtracton equations.
2. Try some subtraction in the tens. Make a tens number. Subtract a smaller number from it. Does the calculator work right? Try these: 23 - 4 = ☐ 39 - 8 = ☐ 53 - 11 = ☐ 77 - 31 = ☐ 82 - 52 = ☐ 93 - 88 = ☐ Check your answers with someone else.
3. Show a hundreds number on your calculator. Subtract a lower number from it. Try some more equations of your own.
4. Show a thousands number on your calculator. Subtract a lower number from it. Try some more equations.

MULTIPLICATION

1. Now let's multiply using the calculator. Add 8 + 8 + 8 = 24. You can make it easier by multiplying 3 x 8 = 24. Put the pointer on 8 and dial to the right; dial it 3 times. What number did you get in the window? The multiplying you just did was done by multiple addition. Try 3 x 7 or 7 + 7 + 7. Try multiplying with other numbers.
2. Try these multiplication equations: 3 x 4 = ☐ 4 x 5 = ☐ 7 x 6 = ☐ 6 x 9 = ☐ 8 x 7 = ☐ 9 x 9 = ☐ Try some equations of your own.
3. Try some multiplication equations that are harder: 12 x 7 = ☐ 14 x 5 = ☐ 22 x 6 = ☐ 38 x 13 = ☐ Hint to do the last one a quick way use 3 dials. Use the ones and 10's dial, dial 38; dial it 3 times. Use the 100's and the 10's dial, dial 38; dial it once.

$$\begin{array}{r} 38 \\ \times 13 \\ \hline 114 \\ 38 \\ \hline 494 \end{array}$$

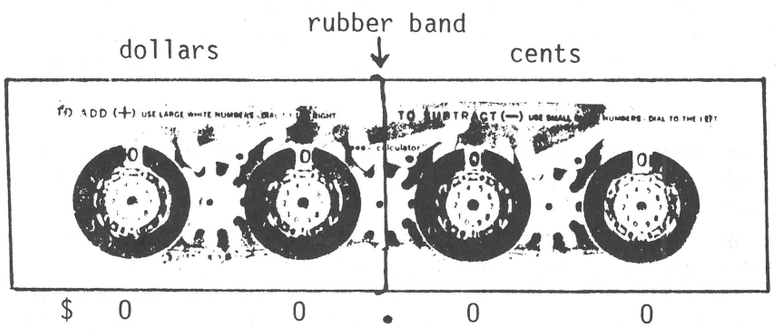
Try some problems of your own.

DIVISION

1. Now let's divide using the calculator. Clear your machine. Try 12 ÷ 4 = 3 . First dial to the right and put 12 in the windows. Put your pointer in the small black numeral 4. Dial to the left. How many times do you subtract 4 from 12 to get 0 in the windows? You are right, 3 ! You have just divided by multiple subtraction. 12 - 4 - 4 - 4 = 0 12 ÷ 4 = 3
2. Try these division problems: 4 ÷ 2 = ☐ 9 ÷ 3 = ☐ 15 ÷ 3 = ☐ 25 ÷ 5 = ☐ 16 ÷ 8 = ☐ 45 ÷ 9 = ☐ Make up and try some division equations.
3. Try some harder division problems: 54 ÷ 9 = ☐ 78 ÷ 13 = ☐ 300 ÷ 30 = ☐ 420 ÷ 84 = ☐ 5280 ÷ 176 = ☐ (Hint: You may want to use the first dial on your left to keep track of the number of times you dial.) Try some division equations with someone else. Can you do some division problems which have a remainder in the windows?

DECIMALS

1. Use the rubber band around your calculator as a decimal point like this:



Show $36.42 on the calculator. Add $25.79. What is the total? Make up your own money problems.
2. Move the rubber band to another place. Try making up some problems with decimals.

EQUATIONS

1. Play a game with someone! Make up some difficult problems. You use the calculator. Let the other person figure the problem without a calculator. See who can finish first!
2. Can you think of any other games?
3. How are you doing? Do these equations on your calculator: 1342 + 127 = ☐ 843 - 278 = ☐ 34 x 4 = ☐ 45 x 16 = ☐ Hint: to do this a quick way you will have to work with 3 dials! 45 x16 Also try this: 55 ÷ 15 = ☐

ANSWERS: 1342 + 127 = 1469 843 - 278 = 565 34 x 4 = 136 45 x 16 = 720*
55 ÷ 15 = 3 and a remainder of 10 or 3 10/15 or 3 2/3

* 45 x16 = 270, 45 = 720

One possible procedure: Use the tens and ones dials and dial 45; dial it 6 times. Then use the hundred and tens dials and dial 45; dial it only 1 time.

Another possible procedure: Use the ones dial, dial 5; dial it 6 times. Use the tens dial, dial 4; dial it 6 times. Use the tens dial, dial 5; dial it only 1 time. Use the hundreds dial, dial 4; dial it only 1 time.

Here are some other things you might want to do with your calculator. Keep track of mileage by putting into the calculator the last 4 numbers of your car's odometer. Keep adding in your purchases as you shop in the super market; the cash register total (except for tax) should come out the same as your calculator total. Think of other things.

The Pascal-type calculator is manufactured and distributed by BURT HARRISON & CO., P.O. BOX 732, WESTON, MA 02193.
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